

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for data recovery in a disk drive system wherein the disk drive system includes a data disk drive and a disk drive controller, comprising the steps of:

reading data from the data disk drive;

generating an error detection and correction code from the data read from the data disk drive; and

in parallel with the reading of the data from the data disk drive and the generating an error detection and correction code from the data read from the data disk drive, reading error detection and correction code metadata,
wherein the error detection and correction code metadata is stored in a disk drive separate from the data read from the data disk drive.

2. (Original) The method of Claim 1, further comprising comparing the generated error detection and correction code of the read data with the error detection and correction code stored as metadata.

3. (Currently Amended) The method of Claim 2, if the generated error detection and correction code of the read data matches the error detection and correction code stored as metadata, then accepting the data read from the data disk drive as valid data.

4. (Original) The method of Claim 2, if the generated error detection and correction code of the read data does not match the error detection and correction code stored as metadata, then reconstructing data from parity data.
5. (Original) The method of Claim 4, further comprising generating an error detection and correction code for the reconstructed data.
6. (Original) The method of Claim 5, further comprising comparing the error detection and correction code stored as metadata with the reconstructed data error detection and correction code.
7. (Original) The method of Claim 6, if the error detection and correction code stored as metadata matches the reconstructed data error detection and correction code, then accepting the reconstructed data as valid data.
8. (Original) The method of Claim 6, if the error detection and correction code stored as metadata does not match the reconstructed data error detection and correction code, then accepting the data read from the data drive as valid data.
9. (Original) The method of Claim 1, wherein the error detection and correction code is a cyclic redundancy check.
10. (Original) The method of Claim 1, wherein the size of the error detection and correction code metadata is a data block.
11. (Currently Amended) The method of Claim 1, wherein the size of the error detection and correction code metadata is 4 bytes per 512 bytes of data read from the data disk drives.

12. (Cancelled)

13. (Currently Amended) The method of Claim 4, wherein the error detection and correction code metadata, the parity data, and the data read from the data disk drives are all stored on separate disk drives.

14. (Withdrawn) A system for data storage management and data recovery, comprising:

a disk array controller;

a plurality of disk drives coupled to the disk array controller,

wherein the disk array controller uses error detection and correction code metadata to make a first determination as to whether data read from a disk drive is valid and, if the disk array controller determines that the data read from the disk drive is not valid, then the disk array controller uses the error detection and correction code stored as metadata again to make a second determination as to whether the data read from the disk drive is to be presumed valid.

15. (Withdrawn) The system of Claim 14, wherein the disk array controller makes the determinations through hardware.

16. (Withdrawn) The system of Claim 14, wherein the disk array controller makes the determinations through software.

17. (Withdrawn) The system of Claim 15, wherein the hardware includes a shift register and exclusive or gating circuitry.

18. (Withdrawn) The system of Claim 14, wherein the first determination is

made using an error detection and correction code of data read from the disk drives and the second determination is made using an error detection and correction code of reconstructed data from parity.

19. (Withdrawn) The system of Claim 18, wherein the error detection and correction code metadata, the error detection and correction code of the data read from the disk drives, and the error detection and correction code of reconstructed data from parity are on separate disk drives.

20. (Withdrawn) The system of Claim 19, wherein the error detection and correction code of the data read from the disk drives is generated on the fly.

21. (Withdrawn) The system of Claim 19, wherein the error detection and correction code of the data read from the disk drives is generated from the data after it has been received by the disk array controller's data cache.

22. (Withdrawn) The system of Claim 19, wherein data integrity protection occurs at a byte level.

23. (Currently Amended) A method of disk drive data detection and recovery, comprising

reading error detection and correction code metadata associated with data read from a data disk drive;

generating error detection and correction code for the data;

~~using error detection and correction code metadata to determine~~ determining data validity of data read from the data disk drive based on the error detection and correction code metadata and the generated error detection and correction code,

wherein the error detection and correction code metadata is stored in a disk

drive separate from the data disk drive.

24. (Original) The method of Claim 23, wherein the error detection and correction code is cyclic redundancy check.

25. (Currently Amended) The method of Claim 23, wherein the error detection and correction code metadata is compared against the generated error detection and correction code from the data read from the data disk drive.

26. (Original) The method of Claim 23, wherein the error detection and correction code metadata is compared against an error detection and correction code generated from data reconstructed using parity data.

27. (Currently Amended) The method of Claim 23, wherein, if the error detection and correction code metadata equals the error detection and correction code generated from the data disk drive or if the error detection and correction code metadata does not equal the error detection and correction code generated from data reconstructed from parity, then accepting the data read from the data disk drive as valid.

28. (Original) The method of Claim 23, wherein, if the error detection and correction code metadata equals the error detection and correction code generated from data reconstructed from parity, then accepting the data reconstructed from parity as valid.

29. (New) A method for data recovery in a disk drive system wherein the disk drive system includes a data disk drive, a Cyclic Redundancy Check drive and a disk drive controller, comprising the steps of:

reading a data block from the data disk drive into a memory of the disk drive controller;

reading Cyclic Redundancy Check metadata associated with the data block, the Cyclic Redundancy Check metadata being stored on the Cyclic Redundancy Check drive,

wherein the Cyclic Redundancy Check drive is a disk drive separated from the data disk drive;

generating Cyclic Redundancy Check for the data block read from the data disk drive;

comparing the Cyclic Redundancy Check metadata and the generated Cyclic Redundancy Check for a first test;

if the Cyclic Redundancy Check metadata matches the generated Cyclic Redundancy Check, then accepting the data block read from the data disk drive as valid;

if the Cyclic Redundancy Check metadata does not match the generated Cyclic Redundancy Check, reconstructing the data block, then regenerating Cyclic Redundancy Check based on the reconstructed data block, and comparing the Cyclic Redundancy Check metadata and the regenerated Cyclic Redundancy Check for a second test;

if the regenerated Cyclic Redundancy Check metadata matches the Cyclic Redundancy Check metadata, then accepting the reconstructed data block as valid; and

if the regenerated Cyclic Redundancy Check metadata does not match the Cyclic Redundancy Check metadata, then accepting the data block read from the data disk drive as valid.

30. (New) The method of Claim 29, further comprising:

if the regenerated Cyclic Redundancy Check metadata matches the Cyclic

Redundancy Check metadata, then the data disk drive is in error.

31. (New) The method of Claim 29, further comparing:

if the regenerated Cyclic Redundancy Check metadata does not match the Cyclic Redundancy Check metadata, then the Cyclic Redundancy Check drive is in error.